

# VECTOR CONTROL RESEARCH CENTRE

(Indian Council of Medical Research)

PONDICHERRY, INDIA

[Established: 1975]



## OBJECTIVES AND ACHIEVEMENTS



**World Health Organization**  
Collaborative Centre for Research and Training in  
Integrated Methods of Vector Control.



03129

6129

***Community Health Cell***

Library and Documentation Unit

367, "Srinivasa Nilaya"

Jakkasandra 1st Main,

1st Block, Koramangala,

BANGALORE-560 034.

Phone : 5531518

# **VECTOR CONTROL RESEARCH CENTRE**

(Indian Council of Medical Research)

**PONDICHERRY-605006, INDIA**

[Established: 1975]



## **OBJECTIVES AND ACHIEVEMENTS**

**World Health Organization  
Collaborative Centre for Research and Training in  
Integrated Methods of Vector Control.**



---

(Tel: 27396, 27397 & 26784; Telex: 0469 202; Grams: "Mosquito"; Fax: 0413 28132)



# VECTOR CONTROL RESEARCH CENTRE

Department of Health  
Government of India  
New Delhi



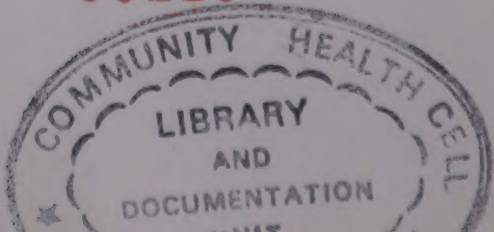
## OBJECTIVES AND ACHIEVEMENTS

World Health Organization  
Collaborative Centre for Research and Training in  
Vector Control and Mosquito Control



DIS-317

06129



## Introduction

The Vector Control Research Centre (VCRC) established in July 1975, is one of the permanent institutes of the Indian Council of Medical Research. It carries out basic and applied research in the field of vector control with the primary objective of finding newer methods and to develop strategy for the control of vector-borne diseases. The VCRC is a multidisciplinary organization, incorporating Medical Entomology, Parasitology, Epidemiology, Microbiology, Clinical studies and chemotherapy, Synthetic chemistry, Biochemistry and Sociology.

The Centre is recognized as the World Health Organization's Collaborating Centre for South-East Asian Region for research and training in integrated methods of vector control. It has been designated to evaluate the newer pesticides under the WHO Pesticide Evaluation Scheme (WHOPES).

Arthropods include the worst of pests of public health importance. Besides being vectors of a number of pathogens, including protozoans, helminths, bacteria, viruses and rickettsiae, they are of considerable nuisance value. Dreaded diseases such as Malaria, Filariasis, Leishmaniasis, Plague, Leptospirosis, Japanese Encephalitis, Dengue, Chikungunya, Kyasanur Forest Disease, Guinea worm and fevers of typhus group are some which are of great concern in India. Infestation due to arthropods, such as scabies, pediculosis and myiasis are also of considerable importance, not to mention those that cause direct injury, such as scorpions, wasps, bees, ants, etc.

### The main objectives of the Centre are:

1. To devise appropriate strategies for the control of arthropods of public health importance incorporating all the known methods and to develop newer methodology and tools wherever necessary.
2. To study the hitherto unknown aspects in the epidemiology of vector-borne diseases including basic studies.
3. Development of human resource in the field of medical entomology and to provide training in vector control and related subjects.
4. To provide consultancy service to appropriate agencies for the development of effective vector control strategies in different parts of the country.

Currently, studies on lymphatic filariasis and its control form the thrust area of research at the Centre.



Some of the significant achievements of the Centre in different fields are listed below:

### Filariasis

1. Filariasis Control Demonstration Project (FCDP) was carried out in Pondicherry urban area (1981-85). It was possible to reduce the filariasis transmission drastically by Integrated Vector Management (IVM), a judicious mixture of all vector control techniques with emphasis on improvement of basic sanitation and environmental methods of vector control.
2. An unique programme for the control of Brugian filariasis in Shertallai, Kerala State is currently in progress. This is a multipronged approach incorporating vector control, chemotherapy, community participation and intersectoral collaboration. Integrated vector management is achieved through pisciculture, weed removal, source reduction and selective use of insecticides. Successful community participation has been achieved by the formation of a People's movement called FILCO to fight filariasis as a collective force. Several Governmental agencies including the Departments of Fisheries, Agriculture, Education, Social Welfare, Health, and National Bank for Agriculture and Rural Development (NABARD) are actively collaborating with the VCRC in this programme.
3. *Epidemiology of filariasis*. In order to develop an appropriate cost effective strategy for the control of filariasis mathematical models suitable for optimizing and predicting the outcome of intervention measures are being developed.
  - (a) *Clinical Epidemiology*: Clinical spectrum of both Bancroftian and Brugian filariasis in different age groups and both sexes has been studied. Mathematical models have been developed to study the progression of the disease from the time of infection.
  - (b) *Parasite dynamics*: Study of dynamics of parasite in human and vector population in the presence and absence of control pressure has shown that drastic reduction in vector density, following IVM measures did not significantly influence the parasite levels in humans in a short span of 5 years. Application of catalytic model on cohort data of microfilaraemia showed that fecundic life spans of *Wuchereria bancrofti* is 5.9 years and that of *Brugia malayi* is 3.5 years. Study of frequency distribution of microfilaria in humans could show that the prevalence is underestimated to 57% and 30% by routine finger prick method in Bancroftian and Brugian filariasis respectively. The relationship between vector and human infection has also been studied using mathematical and statistical approaches.
  - (c) *Chemotherapy*: The VCRC has also initiated studies on chemotherapy in order to compare and contrast with the effectiveness of vector control measures and also to develop integrated disease vector control strategy in specific situations. Selective chemotherapy of microfilaria carriers has been evaluated in field situation both for Bancroftian and Brugian filariasis. The influence of side reactions on community acceptance of the drug was also studied. Mass annual and biannual for Brugian and mass biannual single dose DEC therapy for Bancroftian form have also been evaluated. Selective and contact DEC therapy of mF carriers and family members has also been carried out for the Bancrof-



tian form. Single WHO recommended course of DEC could clear parasitaemia in only 61% of carriers, others needed upto 4 courses.

## **Malaria**

1. *Control of malaria in Pondicherry villages with community participation:* The study showed that income generating schemes are important means of achieving community participation.
2. *Study on the urban malaria problem in Salem town:* The epidemiology of malaria with special reference to the biology and ecology of *Anopheles stephensi* in Salem town was studied. Feasible and effective vector control strategies were recommended to the state health authorities.
3. *Studies on riverine malaria in Sathanur Dam area:* The problem of malaria persistence in Thenpennaiyar riverine villages with special refence to biology and ecology of *Anopheles culicifacies* was studied. Prevalence of sibling species A and B in *An. culicifacies* and extradomiciliary transmission were reported. Suitable vector control measures were suggested to the state health authorities.
4. *Studies on malaria persistence in Rameswaram island:* Seasonal fisherman movement and high man biting propensity of the vector *An. culicifacies* were shown to be the major cause for malaria persistence. Operational deficiencies were identified and suitable remedial measures suggested.
5. *Malaria in Koraput district (Orissa):* All aspects of persistent malaria in this tribal dominated area, have been studied and an appropriate control strategy is being developed. The impact of the present control strategy and related administrative and logistics aspects have also been studied. All four species of human malarial parasites including *P. ovale*, have been recorded in this locality.
6. *Chemotherapy:* The effectiveness of radical treatment of malaria cases has been evaluated in Koraput. Chloroquine sensitivity status of *P. falciparum* by both in-vivo and in-vitro methods were carried out in the district. The results showed that resistance of parasite to chloroquine does not contribute to any great extent for persistence of the problem.

## **Epidemiology and transmission of Japanese Encephalitis (JE):**

Investigations on J.E. epidemics with reference to vector population dynamics, biology and ecology was carried out in Burdwan (West Bengal), Thirunelveli and Virdhachalam (Tamil Nadu).

## **Synthetic Chemistry/Insecticides**

1. A new mosquito repellent DEPA was synthesized at the Centre. This has a wide spectrum of activity against a broad range of arthropod vectors and land leeches and a



prolonged protection. It is relatively cheap compared to available repellent. The technology for its manufacture was handed over to the Defence Research and Development Establishment for commercial exploitation.

2. Controlled release formulations of different larvicides have been developed to increase their active life and reduce the frequency of application in mosquito control programmes.
3. Several second and third generation insecticides developed at the VCRC and elsewhere are being evaluated under the World Health Organization's Pesticide Evaluation Scheme (WHOPES).
4. Development and reversion of Malathion/Fenthion resistance in *Cx. quinquefasciatus* population was studied. While Malathion resistance was relatively stable, Fenthion resistance gradually reverted.

### Biological Control Agents

1. The predatory fish, *Gambusia affinis* was used for control of malaria vector in wells of Pondicherry.
2. *Toxorhynchites splendens*, a predatory mosquito was used for controlling container breeding mosquitoes in coastal villages of Pondicherry.
3. The Centre has been carrying out search for indigenous potent biocides. Bacterial strains of *Bacillus thuringiensis* H.14 and *B. sphaericus* have been isolated and some of these have been ranked as highly effective against mosquito larvae by the WHO collaborating centre, Pasteur Institute, Paris.
4. Technologies for large scale production of larvicidal factor(s) from *Bacillus thuringiensis* H.14 and *B. sphaericus* have been perfected.
5. Slow release formulations of *B. thuringiensis* H.14 and *B. sphaericus* have been developed, which increases the duration of activity and reduces the frequency of application.
6. Large scale production techniques of a mosquito parasitic nematode *Romanomermis iyengari* has been simplified by the use of water instead of moist sand-bed.
7. Three parasitoids of common housefly *Musca domestica* viz *Pachecrepoideus vindemiae*, *Dirhinus himalayanus* and *Spalangia* sp., and one parasitoid of Cockroach *Tetrastichus hagenowii* have been maintained and studied.
8. Small and medium scale field trials of *B. thuringiensis* H.14, *B. sphaericus*, *Romanomermis iyengari* and *Lagenidium* (a fungal agent) have been carried out in field stations in Bangalore, Koraput (Orissa), Shertallai (Kerala), and Rameswaram island. A large scale field trial of *B. sphaericus* against *Cx. quinquefasciatus*, vector of Bancroftian filariasis is currently under progress.





The Director of VCRC receiving Dr. S.P. Tripathy, Director General of ICMR during one of his visits to the Centre



Dr. P.K. Rajagopalan, Former Director of VCRC explaining the field activities to Prof. A.S. Paintal, Former Director General of ICMR at Shertallai Field Station





A night blood screening camp for filariasis in Shertallai



Mass drug administration for filariasis through house visits





Health awareness campaign for a rural community



Health care deliver in a rural village





A water tank covered with aquatic weeds which support *Mansonia* mosquito breeding (Shertallai, Kerala)



The water tank after weed clearance





Tribal population of Koraput district where malaria studies are being carried out



Fever surveillance in a malaria endemic tribal village in Koraput District (Orissa State)





A bioreactor for fermentation of biocides



Laboratory evaluation of new insecticides under WHOPES against mosquito larvae





Mass rearing of mosquitoes



A fourth instar larva of *Cx. quinquefasciatus* with developing *Romanomermis iyengari* parasitic nematode





Collection of indoor resting adult mosquitoes by hand catch



Mosquito larval collection from a breeding site





Post-graduate studies in the laboratory



Post-graduate students are trained in field surveys





Accommodation facilities available for Post-graduate students



The Library reading room



9. *Byproducts from microbial control agents*: The Centre is also engaged in search for byproducts of microbial control agents, which will be of commercial importance.
- (a) Cyclosporin 'A', an immunosuppressive agent used for organ transplantation has been produced from the fungus *Tolypocladium*.
  - (b) L-Dopa, an antihypertension drug has been produced from *B. thuringiensis* H.14.
  - (c) Thrombinase, a thrombolytic enzyme having promising use in prevention and treatment of myocardial infarction, cerebral vascular thrombosis etc. has been developed from *B. sphaericus*.

All the three products are being handed over to commercial agencies through the National Research Development Centre (NRDC), Government of India.

### **Mosquito genetics**

Mosquito genetics studies are being carried out for vectors of malaria and filariasis.

- 1. *Anopheles subpictus*: Sibling species studies have made it possible to differentiate saline and fresh water forms of *Anopheles subpictus*, of which the former was a vector in coastal villages of Pondicherry.
- 2. *Anopheles stephensi*: Two distinct types of *An. stephensi* in the field population were identified based on two distinct Y chromosomes. A brown eye color mutant has also been isolated from natural population of *An. stephensi*.
- 3. *Culex quinquefasciatus*: A red eye color mutant has been isolated from the natural population of *Cx. quinquefasciatus*. Genetic analysis showed that this mutant is sex-linked recessive.

### **Consultancy Services:**

The VCRC provides consultancy services for the development of mosquito/vector control strategies.

- 1. A master plan for mosquito control in Bangalore metropolis has been prepared.
- 2. A master plan for mosquito control in Neyvelli Lignite Corporation Industrial township has been prepared.
- 3. A master plan for mosquito control in Cochin Corporation area is being prepared.

### **Academic activities:**

The Centre has been recognized for conducting the following Post-graduate studies by the Pondicherry and Madras Universities.



1. A two year degree course in M.Sc. Medical Entomology is being conducted. The UNDP/World Bank/WHO Special programme for Research and Training in Tropical Diseases has been supporting this course and it has been ranked No. 1 among all the M.Sc. Medical Entomology courses supported through WHO. So far, a total of 55 candidates, including 3 from abroad sponsored by WHO and 15 in service candidates from State & National organizations have successfully taken this course.
2. Ph.D. programmes have been carried out in the disciplines of zoology, microbiology, chemistry and epidemiology. A total of 25 candidates have obtained the doctorate degree so far.
3. Informal training in vector biology and control has been imparted to scientists, medical officers and middle level workers from India and abroad.

### **Collaboration with National and International Agencies:**

The goal of the Centre is to carry the research finding to the people. This can be achieved only by collaboration with advisory and implementing authorities. Therefore, the Centre has been collaborating with national and international agencies.

1. *Collaboration with Central and State Governments:* The VCRC has been actively collaborating in carrying out research and for consultancy services with different central and state Government departments. These include Defence Research and Development Organization, Gwalior, National Research Development Corporation, New Delhi, Central Insecticides Board, National Malaria Eradication Programme, National Filaria Control Programme and several State Governments.
2. *Collaboration with the WHO:*
  - WHO has named the VCRC as a collaborating Centre for research and training in integrated methods of vector control.
  - The WHO/TDR has supported this Centre with a long-term institutional strengthening grant (ISG) for 5 years.
  - The WHO has recognized the Centre for carrying out evaluation of Pesticides under the WHO Pesticide Evaluation Scheme (WHOPES).
  - Several WHO/TDR funded projects on research have been carried out in the Centre.

### **International Workshop**

The Centre has organized the following international symposia/seminars/workshops:

1. WHO Inter Regional Workshop on "Integrated Control of Vectors with Community Involvement" - 3rd to 8th Oct., 1983.

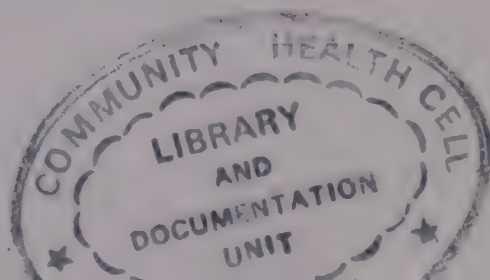


2. Indo-British Workshop on "Filariasis" jointly sponsored by ICMR and British Council - 26th to 30th Nov., 1984.
3. 'VCRC-British Council ODA' Workshop on "Operational Research in Filariasis Control" - 18th Nov. to 6th Dec., 1985.
4. WHO-ICMR Workshop on research review on "Community Participation for Disease Vector Control" - 7th to 9th Feb., 1986.
5. WHO/TDR Informal Consultation on "Bacterial formulations for cost effective vector control in endemic areas" - 19th to 21st Oct., 1988.
6. Steering Committee meeting on "Biological control of vectors" organized by UNDP/WB/WHO/TDR - 24th to 28th Oct., 1988.
7. An International Seminar on "Future Research Needs in Lymphatic Filariasis" - 8th to 10th Oct., 1990.
8. ICMR/WHO Workshop on Biomedical Communication" 1st to 5th June, 1992.
9. WHO/TDR/ICMR Workshop on "Anthropological Research Methods for Filariasis Research" - 16th to 28th Nov., 1992.
10. WHO/TDR/ICMR review meeting on the "Socio-economic research projects on Filariasis in India" - 18th to 19th Dec., 1992.

#### Infrastructural Facilities:

The organization has developed several central facilities, which support other research activities in the Centre.

1. *Maintenance of parasite strains:* The Centre has embarked on studies on certain basic aspects of parasites. *Brugia malayi* is being maintained in-vivo in Gerbils (*Meriones unguiculatus*) and multimammate rats (*Mastomys natalensis*). Attempts are being made for in-vitro cultivation and in-vivo animal models for *Wuchereria bancrofti*. Malarial parasites *Plasmodium gallinaceum* and *Plasmodium berghei* are maintained in-vivo. *Leishmania donovani* is being maintained in-vitro as well as in-vivo.
2. *Rearing and colonization of vectors:* The Centre has been maintaining colonies of 11 species of mosquitoes, one each of sandfly, cockroach and housefly.
3. *Animal house:* Facilities are also available for maintenance of limited number of laboratory animals. At present rabbits, chicken, guinea pigs, rats, mice, multimammate rats, gerbils and cats are being maintained.
4. *Facilities for vector blood meal source identification:* This facility is also open to other Centres in India and abroad.





5. *Library:* Central library facilities with 3112 books, 2127 back volumes of journals, 92 current periodicals, 2200 reports, 6 video cassettes, 4400 reprints, 50 theses and dissertations are available. The library has facilities for computer aided search and retrieval of information. Current contents on disks are also available.
6. *Publications:* The quality and quantity of research at the Centre is reflected from the publications which have come forth over the years. From its inception in 1975, till date (Dec. 1992) 311 documents have been published. These include original research articles, reviews, popular articles and booklets, study reports and miscellaneous publications. A complete list of publications is available on request.
7. *Computer facilities:* In the last 5 years the entire centre has undergone extensive computerization. Two dedicated Novell-LAN (Local Area Network) based file servers have been installed. These are connected to 28 nodes which include two AT 486, three AT 386, two AT 286, 6 PCXTS. Software packages such as Lotus, dBase-IV, MULTIMATE Advantage and SPSS PC + have been acquired and installed for maintaining and analysing data bases on various disciplines. Desk top publishing facilities are also available. Computer data bases for bibliographic services for malaria, filariasis, Japanese encephalitis and toxin (includes insecticides) have been created.
8. *Transport Facilities:* The Centre has several important field projects. Communication facilities form a vital part of these field activities. The Centre has a fleet of 28 vehicles, of which 12 are at Pondicherry, 6 at Jeypore branch, Koraput, 6 at Shertallai, 2 at Mayiladuthurai, 1 at Ponnani and 1 at Cochin in Kerala.

#### **Services:**

In the larger public interest, the Centre has established two Filariasis Clinics one at Pondicherry and the other at Shertallai in Kerala. A Malaria clinic has also been established at the Jeypore branch of the Centre. These clinics provide free medical services to the patients, which include free medical advice and drug distribution. The filariasis clinics run both day and night. In the night clinics, facilities are available for blood smear examinations. Facilities for routine hematology, biochemical estimations, stool examination have been established at the filariasis clinic run at Pondicherry. A minor operation theatre with facilities for carrying out skin biopsy and lymphatic cannulation has also been started at Pondicherry. An attendance of 3366 and 10126 was recorded at the filariasis clinics at Pondicherry and Shertallai respectively in 1992.

#### **Scientific Staff**

DIRECTOR	: Dr. Vijai Dhanda, M.Sc., Ph.D., D.A.P.&E (Lond.)
DY. DIRECTOR (SR. GRADE)	: Dr. P.K. Das, M.Sc., Ph.D.
DEPUTY DIRECTOR	: Dr. K. Balaraman, M.Sc., Ph.D. Dr. K.N. Panicker, M.Sc., Ph.D.



ASSISTANT DIRECTOR	: Dr. S.G. Suguna, <i>M.Sc., Ph.D.</i> Dr. S.P. Pani, <i>M.D., Ph.D.</i> Dr. M. Kalyanasundaram, <i>M.Sc., Ph.D.</i>
SENIOR RESEARCH OFFICER	: Dr. S. Sabesan, <i>M.Sc., Ph.D.</i> Dr. P. Jambulingam, <i>M.Sc., Ph.D.</i> Dr. N. Arunachalam, <i>M.Sc., Ph.D.</i> Dr. T. Mariappan, <i>M.Sc., Ph.D.</i> Dr. K. Krishnamoorthy, <i>M.Sc., Ph.D.</i> Dr. S.L. Hoti, <i>M.Sc., Ph.D.</i>
RESEARCH OFFICER	: Dr. K. Gunasekaran, <i>M.Sc., Ph.D.</i> Dr. Lalit Kumar Das, <i>M.B.B.S.</i> Dr. (Mrs.) Prathiba Jayasimhan, <i>M.B.B.S.*</i> Dr. R. Radhakrishnan, <i>M.B.B.S.*</i> Dr. (Mrs.) A.M. Manonmani, <i>M.Sc., Ph.D.</i> Dr. K.D. Ramaiah, <i>M.Sc., Ph.D.</i> Mr. Dominic Amalraj, <i>M.Sc.</i> Dr. N. Pradeep Kumar, <i>M.Sc., Ph.D.</i> Dr. G. Rajendran, <i>M.Sc., Ph.D.</i> Dr. J. Yuvaraj, <i>B.Sc., M.B.B.S.</i> Dr. A. Subramaniam, <i>M.B.B.S., D.P.H.</i>
TECHNICAL OFFICER	: Mr. K. Viswam Mr. N. Somachary Dr. A.R. Rajavel, <i>M.Sc., M.Phil., Ph.D.</i> Dr. K.P. Paily, <i>M.Sc., Ph.D.</i> Dr. R. Srinivasan, <i>M.Sc., Ph.D.</i> Mr. S. Subramanian, <i>M.Sc.</i> Mr. P. Vanamail, <i>M.Sc.</i>
RESEARCH ASSISTANT	: Mr. C. Sadanandane, <i>M.Sc.</i> Dr. V. Vasuki, <i>M.Sc., M.Phil., Ph.D.</i> Dr. Nisha George, <i>M.Sc., Ph.D.</i> Mr. Sudhansu Sekar Sahu, <i>M.Sc.</i> Mrs. B. Nanda, <i>M.S.W.</i> Mrs. Ambili Kumar, <i>M.A.</i> Dr. M. Jayashree, <i>M.Sc., Ph.D.</i> Dr. M.P. Prasad, <i>M.Sc., Ph.D.</i> Dr. V. Vijayan, <i>M.Sc., Ph.D.</i> Mr. Kailash Prasad Patra, <i>M.Sc.</i> Ms. R. Shanthi, <i>M.S.W.</i> Mrs. Abidha, <i>M.Sc., M.Phil.</i> Mrs. K.S. Snehalatha, <i>M.A.</i> Mrs. A. Krishnakumari, <i>M.A.</i> Mr. K. Govindan, <i>B.Sc.*</i> Dr. Vijayakumar, <i>M.A., Ph.D.</i> Mr. A. Elango, <i>M.Sc., M.Phil.</i> Mrs. Athisaya Mary, <i>M.Sc.</i>



STATISTICAL ASSISTANT : Mrs. A. Srividya, *M.Sc.*  
Mr. A. Manoharan, *M.Sc.*

JUNIOR NURSE : Ms. R. Mary, *B.A., Dip. in Nursing.*

JUNIOR RESEARCH FELLOW: Ms. Sudha Rani, *M.Sc.*  
Mr. A.N. Shriram, *M.Sc.\**

#### **Administrative Staff**

ADMINISTRATIVE OFFICER : Mr. N. Prem Kumar, *B.Com.*

ACCOUNTS OFFICER : Mr. S. Chandrasekaran, *B.Com.*

SECTION OFFICER : Mr. V. Vijayamoorthy, *B.Com.*

SUPERINTENDENT : Mr. V. Ramanathan, *M.Com.*

SENIOR LIBRARIAN : Mrs. R. Sundrammal, *B.Sc., M.L.I.S.*

---

\* Project Staff







